REQUEST FOR PROPOSAL (RFP)

FOR

Tennessee Valley Authority (TVA)

Conservation Voltage Regulation Program

A Voltage Optimization Project

June 23, 2014

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Definitions:

Control Zone: *Control Zone consists of a group of feeders, a single feeder, or a single-phase feeder and the corresponding load that is fed from a head end, three-phase Load Tap Changer (LTC), three-phase voltage regulator, or bank of single-phase voltage regulators. A control zone is considered to be a system in which the head end voltage is continually controlled in response to the lowest end-of-line voltage observed below the head end voltage controller on that same system. The head end voltage control strategy of a control zone must be independent of all other control zones. Any systems in which the voltage controllers are in any way linked to one another (i.e., not independent) are not considered separate control zones. A control zone may include midline voltage regulators, but the feeder and load below that point will not be considered a separate control zone since increased savings facilitated by the midline regulators will be reflected in measurements taken at the head end. If there are systems that use single-phase voltage regulators such that each phase is regulated independently from one another, then each single-phase from this type of system will be considered a separate control zone.*

Conservation Voltage Regulation (CVR): *Conservation Voltage Regulation refers to the practice of reducing operating distribution system voltages to the lower end of the American National Standards Institute (ANSI) Standard C84.1 voltage standard for the purpose of reducing power demand and energy consumption.*

Demand Side Management (DSM): *The term for all activities or programs undertaken by a load-serving entity or its customers to influence the amount or timing of electricity they use. The planning, implementation, and monitoring of utility activities designed to influence customer use of electricity in ways that will produce desired changes in a utility's load shape (i.e., changes in the time pattern and magnitude of a utility's load). Utility programs falling under the umbrella of DSM include energy efficiency, demand response, load management, customer generation, and innovative rates and overlays. DSM includes only those activities that involve a deliberate intervention by the utility to alter the load shape. The load shape changes should be designed to produce benefits to both the utility and its customers.*

Inter-Control Center Protocol (ICCP): *An internationally recognized standard for point-to-point communications between electrical utility control centers, utilities, power pools, regional control centers, and non-utility generators. ICCP uses the Manufacturing Messaging Specification (MMS) for the messaging services needed in data exchange. ICCP is an international standard: IEC 60870-6/TASE.2. ICCP is one of the accepted protocols used over wide area networks (WAN) for data exchange between TVA and other control centers.*

Load Tap Changer (LTC): *A mechanism (including possibly a mechanical device), that can be used to adjust a transformer tap, to cause a change in voltage.*

Supervisory Control and Data Acquisition (SCADA): *A computer system for gathering and analyzing real time data. Industry has used Distribution SCADA (DSCADA) as a distinction between Distribution and Transmission SCADA systems. TVA's SCADA system is a central computing system that monitors and controls the TVA transmission system and balances load and supply in real time. Site control is performed automatically through hundreds of dispersed Remote Terminal Units (RTU).*

Useful Life (estimated): *Useful life of equipment is defined by the length of the contract.*

Voltage Regulator: *A mechanism designed to automatically maintain a constant voltage level. Voltage regulators in control zones will be at the head end of the feeder(s) and may additionally be at midline positions.*

Request for Proposal Details:

1. Background

The Tennessee Valley Authority (TVA) is a corporate agency of the United States that provides electricity for business customers and local power companies serving nine million people in parts of seven southeastern states. TVA's vision is to help lead the Tennessee Valley region and the nation towards a cleaner and more secure energy future with increased reliance upon low-cost cleaner energy sources. In April 2011, the TVA Board approved the Federal Facilities Compliance Agreement (FFCA; Docket No. CAA-04-2010-1760) with the United States Environmental Protection Agency (EPA) and the Consent Decree (CD; Civil Action No. 3:11-CV-00170) with four states and three environmental advocacy groups. As part of these agreements, several environmental projects were identified that support cleaner air across the region and align with TVA's vision for a cleaner energy future. The Voltage Optimization (VO) Project is one of the clean energy projects under the Agreement. Under a voltage regulation program, the voltage is optimized either continuously or as needed to reduce peak energy needs. In 2010, in accordance with the TVA Board's direction to undertake efforts to obtain a demand reduction of 1,400 megawatts (MW) by 2012, TVA took the initial action to issue the SmartGrid RFP that solicited event driven voltage optimization proposals from local power companies in TVA's service territory. This RFP seeks to solicit proposals for a voltage regulation program in which the voltage is optimized continuously.

2. Purpose

Voltage Optimization (VO) projects encourage TVA local power companies and directly served industrial customers to regulate the voltage along distribution feeders so that each service point operates at the lower end of the ANSI C84.1, Range A Service Voltages.

TVA is seeking proposals to implement a voltage optimization project called Conservation Voltage Regulation (CVR). This program is expected to be under control 24 hours per day, seven days a week, and is to be performed by using end-of-line voltage feedback from the farthest points, electrically, on the distribution feeders. Fundamentally, the feedback will be used to control the magnetically coupled voltage regulator or load tap changing transformer located at the head end of the distribution feeder. Mid-line capacitor banks within a control zone may also be used to maintain the end-of-line voltage within limits, but the feeder and load below that point will not be considered a separate control zone. CVR is intended to be used on feeders that have loads consisting primarily of residential and light commercial customers. This voltage reduction is expected to deliver an overall energy and capacity savings to TVA typically on the order of 0.5% – 4% of the energy delivered. In addition, voltage optimization provides the capability to improve the overall power quality on the feeders, and will likely deliver significant reactive power savings to selected program participants.

Two CVR demonstration pilots were conducted to obtain measured data and evaluate seasonal results at Ripley Power System, and in a campus environment, Murray State University, in 2010 and 2011 respectively.

At Ripley Power System, TVA worked with the local power company to install an AdaptiVolt CVR system at three of its substations. The winter evaluation period ran from August 2009 to March 2010. The results are attached to this RFP as Appendix IV.

At Murray State University, TVA incentivized the University for the installation of an AdaptiVolt CVR system. The summer evaluation period ran from April 2011 to September 2011. The results are attached to this RFP as Appendix V.

3. CVR Objective

The objective of the CVR program is to deliver capacity and energy savings that help TVA reduce or avoid building additional generation resources, starting additional units during peak periods of power demand, or buying high priced power in the marketplace. Demand Side Management (DSM) techniques ultimately provide benefit at the transmission level in support of these objectives.

Studies have shown that, typically, 5% of the energy savings resulting from use of CVR occurs within a local power company's power system and the remaining 95% occurs beyond the retail meter. CVR provides a benefit to the participants in reducing losses within the distribution system and provides a significant benefit to the end-use customer in the form of lower demand and energy payments. At the same time, the participants' demand and energy payments to TVA may be lower due to the CVR application.

With the reactive savings component of CVR, participants will gain some relief from having to provide the level of reactive support they would otherwise be providing without CVR. In addition, they may obtain some reactive demand relief when using CVR. Another benefit of CVR deployment includes greater visibility of a participant's distribution system by installing newer technologies and observation points needed to verify results.

A CVR Guidebook to help potential participants determine which feeders and technology may be optimal for CVR on their systems is attached as Appendix VI.

4. RFP Objective

TVA is requesting proposals that provide kilowatt hour (kWh) reductions utilizing CVR voltage feedback techniques.

A. This product will be priced at $0.01/kWh for each kWh of reduction that selected participants deliver to TVA in each control zone.

B. The program objective is to encourage participants to operate the CVR equipment to reduce their kWh energy requirements. Participants will submit requested measurement and verification information to TVA. TVA will calculate the actual reductions that were made and pay participants at the above rate on a periodic basis for the duration of the contract. Appendix VII attached to this RFP is the CVR Program Settlement Protocol methodology TVA will utilize to provide performance payments to selected RFP participants. Each control zone data submission will have a common file extension, be stamped for date and time, and be identified by program participant, substation and feeder location (longitude and latitude), observation point, units of measure, and value recorded during specified time interval.

C. After the CVR equipment is installed and commissioned by the participants, an On/Off testing period begins. The purpose of the On/Off testing period is to establish:

   a) Energy savings factor due to CVR, for each season, for each control zone, for each proposer, in settlement calculations.
   b) Seasonal baseline head end voltages (converted to 120V scale) for each control zone corresponding to the head end voltage measured during CVR-on and CVR-off settings, or 126V, whichever is less.

The On/Off testing period will consist of alternating CVR-on and CVR-off days for one year to provide coverage of the expected variation in temperature and load on registered control zones. Transition from CVR-on to CVR-off or vice versa will occur each midnight during the testing period. During the one-year period of testing, the CVR equipment must be operated "on" for a 24 hour period and then switched "off" for a 24 hour period. The transition from "off" to "on" or vice versa must occur at hour ending 24:00 hours +/- 15 minutes each day. TVA will take the data from one year of On/Off testing and calculate the energy savings factors that indicate how the feeder responds to voltage reduction. If unusable data is obtained, then the testing must be repeated.

During these periods of On/Off testing, and the interstitial months, deemed values for energy savings and voltage reduction will be used in settlement calculations of energy savings. Deemed values will be used starting the first month of implementation following control zone registration and continue to be used until the seasonal energy savings factor and seasonal baseline (On/Off) voltages, specific to the control zone, are determined from the analysis of data collected from the one year On/Off testing period. The applicable energy savings factor and voltage reduction factor for use in settlement during the initial On/Off testing period will be 0.005 and 1, respectively. A settlement true-up will follow, accounting for the seasonal energy savings factor and seasonal baseline (On/Off) voltages estimated from the analysis of the On/Off testing period data. This will be an upward-only true-up, meaning that participants may receive additional payment but will not be required to repay TVA if savings are below the level corresponding with the deemed values during the initial testing period.

TVA will pay selected participants for a deemed energy reduction during the one year On/Off testing period. Applying the deemed values referenced above to Settlement Equation 1 (see Appendix VII, Section 6) the energy reduction calculation becomes:

$$\Delta Energy_{m,j} = Energy\ Observed_{m,j} \times 0.00503$$

Where,

$\Delta Energy_{m,j} \coloneqq$ ***Energy savings for month m for registered Control Zone j***, and
$Energy\ Observed_{m,j} =$ ***Energy metered during month m at the point of regulation for Control Zone j***.

D. Any contract resulting from this RFP is anticipated to be a pay for performance contract.

E. The CVR program will be implemented by the selected participants in a manner that ensures TVA's compliance with the provisions of the FFCA/CD concerning the Voltage Optimization project. Pertinent provisions of the FFCA are identified in Appendix II. Links to the FFCA and CD are provided in Appendix II, and organizations considering submitting a proposal must familiarize themselves with these agreements.

5. Scope of Project

All organizations intending or considering to submit a proposal in response to this RFP are requested to remit by July 14, 2014, an "Intent to Bid" form (See Appendix I) to the designated RFP contact person, Veronica (Roni) Wilson at vwilson@tva.gov.

The scope of this project includes the following:

5.1 Measurement of CVR benefit per CVR Program Settlement Protocol

See Appendix VII to RFP.

5.2 Permitting

The proposer will obtain all environmental permits, site permits/licenses and other required approvals for the project as necessary.

5.3 Environmental Review and Acceptability if Required

A. All interested parties are urged to consult TVA's National Environmental Policy Act (NEPA) Compliance procedures prior to submitting aproposal to determine the likelihood that, and the timeline in which, their project can be reviewed for environmental acceptability. This process typically involves preliminary determinations by TVA of:
   a) whether provisions of the NEPA and related laws apply to the decision; and,
   b) if so, which of the three levels of review would be initiated;
   c) TVA's implementing procedures for NEPA are available at www.tva.com/environment/reports/pdf/tvanepa_procedures.pdf.

B. Proposers are responsible for all costs associated with the conduct of, and preparation of documentation for, the appropriate level of environmental review. If the provisions of NEPA apply, proposers may:
   a) Use TVA as the preparer;
   b) Use a TVA pre-qualified contractor; or,
   c) Propose a contractor for the project by submitting the contractor's qualifications for evaluation and determination of acceptability by TVA.

5.4 Data Submission

Data submissions should include technical specifications for the source equipment that provides the required measurement data specified in the CVR Settlement Protocol for program observability by TVA. The detail methodology for data error resolution and the flow of data mechanism and format (unique ID, data structure, transfer protocol, etc.) should be included in the proposer's response.

Proposer must include results of an engineering evaluation tool as part of the proposal. See Appendix IX for the User Guide for Control Zone Evaluation Tool (CZET) as one such example. The CZET is accessible on TVA's secure customer portal, Online Connection.

5.5 Detailed Front End Engineering Design (FEED)

Front end engineering design submissions shall be composed of the following elements:

A. A single-line diagram of substations and control zones where CVR is being applied (see Appendix XI for CVR Arrangement Examples – available in a customizable format at TVA's secure portal, Online Connection, at https://onlineconnection.tva.gov/Pages/CVR.aspx.
B. An associated Engineering Study for control zones with identified constraints.
C. A Geospatial Information System (GIS) view of their system accompanied by a Load Flow analysis to locate each respective control zone.
D. Feeder level data that support the CVR application, Load Flow analysis, and engineering study.
E. Data source format provided should have a common file extension from industry equipment such as data loggers, DSCADA systems, or revenue (quality) meters.
F. Delineation of data transfer preference as described in Section 5.4. Examples of acceptable formats would be a flat file transfer to a secure File Transfer Protocol (FTP) site or control system to control system transfer via ICCP (see Appendix VIII for ICCP Data Communication Link Guidelines if this method is preferred).

Proposer may elect to request compensation for full, continuous operation of the proposed CVR system during the time period between January 22, 2013, and the execution of a contract award. The request must demonstrate the proposer's continuous operation of its system to maintain the

appropriate feeders in the lower half of the ANSI band. Compensation will be made according to the terms of the test period (see Section 4 Item C) on a control zone-by-control zone, length-of-operation basis if eligibility is verified. Requests should complete the compensation request portion of Appendix III and also must include the following information:

A. The six front-end engineering design criteria listed above.
B. Verifiable documentation of in-service date of each feeder's control system.
C. Documentation of continuous operation of each feeder's control system from in-service date.
D. An engineering determination of load makeup of each feeder for which compensation is requested.

Note: A 12 month On/Off Test period will still be required to verify results.

5.6 Subcontractor Selection

Proposer will determine which project tasks will be subcontracted and be responsible for reviewing the capabilities of individual subcontractors based on previous project experience and track records. Proposals shall include resumes of key personnel. The individual who has lead responsibility for applying this measurement for settlement protocol to an automated CVR system must have a full understanding of the following:

A. Appropriate and demonstrated knowledge of the application of CVR to distribution systems and the underlying physics of the relationship between operating voltage levels and energy consumption.
B. Appropriate and demonstrated knowledge of the use of engineering time series analysis.
C. Appropriate and demonstrated knowledge of the use of Robust Statistical procedures used to analyze non-Gaussian data.
D. Appropriate knowledge of distribution feeder and substation operations.
E. Understand and articulate the requirements and procedures of the measurement for settlement protocol and the system capabilities to provide such data.
F. The individual must also be able to successfully:
    a) Operate and program in a MatLab® M-Code environment or demonstrated proficiency in a similar data analysis tool.
    b) Inspect and interpret raw feeder energy and voltage data and summarize findings for presentment.

5.7 Equipment Specification and Procurement

A. Data recording periods should be no greater than one hour, and can be as short as individual systems allow. Weather data should be collected on the same time period as the load data. Data collected is subject to audit by TVA.

B. Voltage monitors should have linearity of better than 0.5% within the expected ranges of voltage and the temperature drift should be less than 0.5% from -40 degrees C to 65 degrees C. Power monitors should be of revenue-grade accuracy but need not be revenue-class.

C. Instruments and meters should be shop calibrated. Field verification and inspections will be required to verify correct installation and readings.

D. One or more years of historical regulator or LTC setting information should be made part of the verification data records submitted.

E. Eligible projects include all installations or implementations of automatic CVR systems on utility substations or feeders where these automated systems can:
    a) be turned on and off on a daily basis;

b) have the voltage set-points changed on a daily basis;

c) have the ability to measure and record, on a per control zone basis:
   i. period average bus voltage,
   ii. period average end-of-line voltage,
   iii. period kWh,
   iv. period kVARh,
   v. period average temperature.

F. The ideal application would be where the automatic CVR control components could also monitor and store the period data.

5.8 Construction

The proposer will be responsible for all construction activities necessary to properly and safely build and install a CVR system and the associated power generation system.

6. Proposal Content

Proposals should be organized into the following sections and provide the requested information.

6.1 Cover Letter

A. Proposer Name
B. Organization
C. Mailing address
D. Email address
E. Phone number
F. Total estimated cost of project
G. Project name
H. Brief project executive summary

6.2 Form for Proposal Title Page (Appendix III)

6.3 Project Narrative

A. The proposer will write a clear and concise description of the overall project approach, including specific activities that will take place. Particular attention should be paid to description of plans, strategies, methods and activities that would enable the Contractor to be successful in meeting the CVR program goals set forth in this RFP.

6.4 Qualifications and Experience

A. The proposal shall demonstrate the strength of the collaborative partnership by providing a brief biography for each key person and/or subcontractor, detailing titles, and experience on relevant projects.

6.5 Technical Information

Proposer shall supply documents, drawings, calculations, etc., sufficient to provide:

A. System description
B. Site/location of equipment being installed
C. Site arrangement/equipment layout
D. Equipment details and description

7. Budget Information

The proposal will include the estimated price to perform the work. The proposer shall also disclose the amount and sources of "additional funds" intended for use towards the project. These additional funds may be funds made available by the proposing entity itself, but could also include, for example, money allocated under other EPA Agreements to States or under government incentive programs.

8. Maintenance Plan

The proposal shall include a proposed maintenance plan for the successful operation of the voltage optimization equipment that details how the participant will meet and/or exceed the Estimated Useful Life of the equipment.

9. Legal Authority

Please identify the proposing entity's (1) legal authority for accepting the funds TVA would provide for this project, and (2) legal authority to conduct the project.

10. Letters of Support (optional)

Please include a signed letter of support from a representative of each member organization comprising the proposal team.

11. Schedule

Milestone	Date
RFP Release Date	June 23, 2014
Intent to Bid Form Due	July 14, 2014
Open Window for Submitting Questions	June 24 – August 8, 2014
Responses to Questions	July 7, 2014 – August 18, 2014
Proposal Due Date	August 25, 2014, 8:00 p.m.*
Evaluate Proposals and Award Contract(s)	October 31, 2014 (estimated)

* In order to be considered, proposals must be received by TVA by 8:00 p.m. central time on August 25, 2014.

12. Evaluation, Award, and Discussions

TVA may contact proposers for clarification as necessary. This RFP does not commit TVA to make an award. TVA reserves the right to select the proposal(s) considered to be in the overall best interest of TVA. TVA reserves the right to reject any or all proposals if such action is in the best interest of TVA.

12.1 Evaluation Factors

TVA may consider various factors such as relative quality and adaptability of supplies or services, financial responsibility, safety history, skill, experience, past performance, record of integrity in dealing, technical capability, and time of delivery. Evaluation criteria to be considered by TVA in determining which proposal is most advantageous to TVA may also include:

A. Ability to meet TVA technical requirements and specifications;
B. Quality of products or services offered;
C. Experience and past performance.

12.2 Financial capability

As part of its evaluation, TVA may investigate the qualifications, references, and facilities of a Proposer, including an inspection of a Proposer's offices, distribution, and manufacturing facilities. By submitting a proposal, the Proposer hereby agrees to cooperate with TVA in conducting any such investigation. Further, Proposer agrees that TVA may perform survey or visit the Proposer's facilities, and perform a pre-award cost audit.

12.3 Acceptable Proposals

Proposals must contain the information requested and shall be in sufficient form and detail to enable a comprehensive understanding and analysis. Prior to evaluation, TVA's authorized representative may review proposals to determine compliance with preparation instructions, terms and conditions, and other administrative conditions. Failure to comply with the requirements of this solicitation may cause a proposal to be rejected without further consideration.

In addition to any other evaluation criteria, Proposers may be evaluated on their financial condition and strength to support TVA's requirements. This evaluation may be done on a pass/fail basis. Proposals which, in TVA's sole judgment, do not have the financial capabilities to support TVA's requirements will not be considered for award.

12.4 Evaluation Process

TVA may evaluate the proposals using numeric scoring and compute a total score for each proposal. If using this method, TVA will establish a competitive range. TVA may, in its discretion, request clarifications or conduct discussions with any or all Proposers, or only those Proposers in the competitive range, if any.

12.5 Evaluation Tool

Control Zone Evaluation Tool is currently available. Go to the secure portal TVA Online Connection for this tool: https://onlineconnection.tva.gov/Pages/CVR.aspx

13. TVA Contact Information

The designated RFP Contact Person is:

Veronica Wilson
Tennessee Valley Authority
Contract Manager
1101 Market Street, LP 4T
Chattanooga, TN 37402
vwilson@tva.gov Email
(423) 751-2111 Telephone

Proposals must be submitted to Veronica (Roni) Wilson.

All questions about this RFP during the Open Window for Submitting Questions should be sent to CVR@tva.com. Answers to questions that are material to potential proposers will be posted to the TVA Online Connection page at https://onlineconnection.tva.gov/Pages/CVR.aspx or provided electronically to potential proposers. Upon receipt of this solicitation, Proposers are not to contact TVA personnel other than the TVA representative designated in this solicitation for information, questions, explanations, or details. Failure to follow communication guidelines may result in exclusion from consideration.